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cancel.*

resulting in mechanical damage to the surface of the contact pad. In a well controlled testing production line, the distribution of the probe marks (or the damaged surface area of the contact pad) is limited (controlled) to an area in the range of about 60 x 60  $\mu\text{m}$ . Damage to the contact pad surface may occur in the form of a dent or may even become severe enough that the surface of the contact pad is broken, resulting in burring of the surface of the contact pad. After the contact pads have been used as I/O points during high speed testing, a number of these contact pads are frequently used for the creation of solder or gold bumps over the surface thereof. In instances where the surface of the contact pad is damaged, it is clear that this surface forms a poor basis over which to create a solder bump or a gold bump. The invention addresses this concern and provides a method whereby surface damage to contact pads is removed.

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IN THE CLAIMS

Please amend the claims as follows.

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1. (Amended) A method for forming a metal bump on a semiconductor substrate, comprising the steps of:

providing a semiconductor substrate, said semiconductor substrate having been provided in or on the surface thereof with

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a contact pad, said contact pad sitting on an underlying layer of dielectric and being in electrical contact with at least one point of electrical contact in or on the surface of said substrate;

depositing a layer of passivation over the surface of said layer of dielectric underlying the contact pad, including the surface of said contact pad;

patterning and etching said layer of passivation, creating an opening in said layer of passivation having a first diameter, partially exposing the surface of said contact pad over a surface area of said first diameter, said first diameter of said opening created in said layer of passivation being smaller than a surface area of said contact pad by an amount;

etching said contact pad, using said layer of passivation as a mask, partially or completely first removing said contact pad from above the surface of said layer of dielectric, creating a opening in said contact pad having a diameter being about equal to said first diameter;

sputtering a layer of Under Bump Metallurgy (UBM) over the surface of said layer of passivation, including said opening created in said contact pad;

depositing and patterning a layer of photoresist, creating an opening in the photoresist with a slightly larger dimension than said first diameter;

electroplating a layer of bump metal in the photoresist opening;

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amcd.* stripping the layer of photoresist and etching said layer of UBM, using said layer of bump metal as a mask; and

reflowing the surface of said layer of bump metal, forming the metal bump.

2. (Amended) The method of claim 1 wherein said opening created in said contact pad has a depth that is less than a height of said contact pad by an amount.

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*a4* 8. (Amended) A method for forming a metal bump on a semiconductor substrate, comprising the steps of:

providing a semiconductor substrate, said semiconductor substrate having been provided in or on the surface thereof with a contact pad, said contact pad sitting on an underlying layer of dielectric;

depositing a layer of passivation over the surface of said layer of dielectric, including the surface of said contact pad;

patterning and etching said layer of passivation, creating an opening in said layer of passivation having a first diameter, partially exposing the surface of said contact pad over a surface area of said first diameter, said first diameter of said

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opening created in said layer of passivation being smaller than a surface area of said contact pad by an amount;

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depositing a layer of polyimide over the surface of said layer of passivation, including the opening created in said layer of passivation;

patterning and etching said layer of polyimide, creating an opening in said layer of polyimide having a second diameter, partially exposing the surface of said contact pad over a surface area of said second diameter, said second diameter of said opening created in said layer of polyimide being smaller than said first diameter by an amount;

etching said contact pad, using said layer of polyimide as a mask, partially or completely removing said contact pad from above the surface of said layer of dielectric, creating an opening in said contact pad having a diameter being about equal to said second diameter;

sputtering a layer of Under Bump Metallurgy (UBM) over the surface of said layer of polyimide, including said opening created in said contact pad;

depositing and patterning a layer of photoresist, creating an opening in said layer of photoresist with a slightly larger dimension than said second diameter;

electroplating a layer of bump metal in the opening created in said layer of photoresist;

stripping said layer of photoresist;

etching said layer of UBM, using said layer of bump metal

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reflowing the surface of said layer of bump metal, forming the metal bump.

9. (Amended) The method of claim 8 wherein said opening created in said contact pad has a depth that is less than a height of said contact pad by an amount.

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*A5* 16. (Amended) The method of claim 15 wherein said removal surface area of said contact pad is smaller than a surface area of said contact pad by an amount.

17. (Amended) The method of claim 15 wherein said removal thickness of said contact pad is less than a height of said contact pad by an amount.

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Sub 637* 19. (Amended) The method of claim 15 wherein said partially removing said contact pad comprises the steps of:

depositing a layer of passivation over the surface of said layer of dielectric, including the surface of said contact pad;

patterning and etching said layer of passivation, creating an opening in said layer of passivation having a first diameter,

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cancel.* partially exposing the surface of said contact pad over a surface area of said first diameter, said first diameter of said opening created in said layer of passivation being smaller than a surface area of said contact pad by an amount; and

etching said contact pad, using said layer of passivation as a mask, creating an opening in said contact pad having a second diameter, partially or completely first removing said contact pad from above the surface of said layer of dielectric, said second diameter of said first opening created in said contact pad being about equal to said first diameter of said opening created in said layer of passivation.

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28. Please cancel claim 28.

29. Please cancel claim 29.

30. Please cancel claim 30.

31. Please cancel claim 31.

*a7* 32. (Amended) The method of claim 15 wherein said partially removing said contact pad comprises the steps of:

depositing a layer of passivation over the surface of said layer of dielectric, including the surface of said contact pad;

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patterning and etching said layer of passivation, creating an opening in said layer of passivation having a first diameter, partially exposing the surface of said contact pad over a surface area of said first diameter, said first diameter of said opening created in said layer of passivation being smaller than a surface area of said contact pad by an amount;

depositing a layer of polyimide over the surface of said layer of passivation, including the opening created in said layer of passivation;

patterning and etching said layer of polyimide, creating an opening in said layer of polyimide having a second diameter, partially exposing the surface of said contact pad over a surface area of said second diameter, said second diameter of said opening created in said layer of polyimide being smaller than said first diameter by an amount; and

etching said contact pad, using said layer of polyimide as a mask, partially or completely removing said contact pad from above the surface of said layer of dielectric, creating an opening in said contact pad having a diameter being about equal to said second diameter.

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34. Please cancel claim 34.

35. Please cancel claim 35.